

roadway to a width slightly greater than the powdered asphalt spreader, and powdered asphalt was applied at the rate of one-half pound per square yard. Alternate mixing and applying powdered asphalt in one-half pound amounts per square yard was continued until three applications were made. The mixing was again resumed until a visual inspection showed the mixture to be thoroughly completed and uniform in color.

The bituminous mixture was spread to grade and cross-section, using both a grader and a motor patrol. A small amount of covering aggregate, approximately 15 pounds per square yard, was applied, tailgating it from trucks, and the surface was rolled with a 10-ton, three-wheeled roller.

Traffic was not kept entirely off the road during construction. However, signs were erected at the end of each day's work.

The cost of construction of a 1½-inch compacted thickness, including flux oil, powdered asphalt, gravel, stone, blading, rolling, and finishing, amounted to \$0.22 per square yard. The cost of the bituminous cement was approximately the same as for other types of bituminous construction of like thickness and aggregate grading. Possibly the combining of aggregates and bituminous cement was accomplished in less time and with less expense by use of flux oil and powdered asphalt than might have been the case had other types of bituminous cements been employed.

The road has now been in use approximately six months and gives every evidence of becoming one of the best bituminous roads in Howard County.

## TAR ROADS

Nate E. Weekly,  
Randolph County Road Supervisor,  
Winchester

The most important factor in building any road is drainage. The right-of-way should be at least 40 feet with adequate side-ditches. The roadway should be 24 feet with culverts and bridges widened to the same width. It is also an important factor to have the curves properly banked. The crown of the road is another factor, and a very important one. I would recommend ¼-inch to the foot; all that is necessary is sufficient crown to insure proper drainage.

Of all the road hazards, poor visibility is the most serious. The small, sharp hills or knolls, all too numerous on our roads, must be cut down to a gradual incline to allow visibility of at least 600 feet, and sharp turns and jogs must be eliminated.

Sufficient time should elapse after the grade has been completed for shoulders to settle, and grade or base to become

thoroughly compact. I would recommend that these factors be taken care of a year in advance of the laying of the bituminous mat, and that a smooth surface be maintained. It may be necessary to strengthen the base so that it will be thick enough to withstand heavy traffic.

Adequate equipment is an important factor in the building of tar roads. We use a 60 crawler tractor, a 12-foot grader, a 7-blade maintainer, a 7½-ton roller, and a tar distributor.

It is necessary first to grade the base smoothly before spreading any aggregate; then 300 cubic yards per mile of crushed limestone or graded gravel may be spread evenly over the road bed. A spreader box is often used to spread the aggregate; however, in our county, we spread with dump trucks. The aggregate can be put on evenly in this manner if the personnel is properly trained. The grader is used to blade the aggregate to one side of the road centerline. Tar is applied to the cleared surface at the rate of 0.3 gallon per square yard. The aggregate is then bladed to the other side of the road and the same procedure repeated. If the base is damp and the weather cool, I would suggest using tar TC-1. Should the weather be extremely hot and dry, it would be advisable to use tar of a viscosity of 18 to 25, and heated to 125° to 150° F. After the base has been primed, the aggregate should be spread evenly over the bed and 0.6 gallon of the same grade of tar applied per square yard. No time should be lost in blading the materials into windrows and immediately mixing with the maintainer.

I do not hesitate to say that the most important element in the organization is the efficiency of the road supervisor, and that the extent of his success or failure rests with his knowledge of the bituminous materials to be applied. The aggregate must be thoroughly coated and the mixing done as quickly as possible to keep the mix from becoming tacky. The man chosen for the final floating and finishing of the surface should possess more than ordinary skill in operating the blade. He must obtain a uniform spread of the mix and blade the material to a true contour for the finished road surface. When spreading has been completed, the surface is rolled solid and smooth. If any lean places appear, the distributor may be used for retouching. The road may be opened to traffic as soon as the mat is set up.

*In order for the mat to become thoroughly seasoned, four weeks should elapse before the seal coat is applied.* I recommend that TH-2 tar be used for sealing. The seal coat may be applied after the road has been swept perfectly clean. This consists first of 0.2 gallon of tar and 20 pounds of ½-inch to ¾-inch stone per square yard, and then an additional 0.2 gallon of tar as a final application and main-

tained lightly. This tar is applied at a temperature of from 250° to 275° F. and rolled once.

The cost of the seal coat is from \$450 to \$500 per mile, while the entire expenditure is approximately \$1,800 to \$2,000 per mile.

The maintenance of a tar road is not expensive. It is probably best to retreat a surface of this type every 3 to 5 years. This will cost about \$350 to \$400 per mile for material. The patching required is a minor item.

In the past 20 years there has been much progress in road construction in the State of Indiana. But I say to you that there is yet much to be accomplished. There remain many hazards on the county roads, and this is also true of the state highways as well. Thousands of lives are lost because of the numerous narrow bridges and culverts, sharp turns, and many other dangerous places. These hazards can be eliminated only if funds are properly provided and spent intelligently. The motorists are looking to the roadmen for safe roads on which to drive. They pay the bills.

### CUTBACK ASPHALT

W. M. Barnes,

Howard County Road Supervisor,  
Kokomo

Bituminous material is of a cementive nature and includes such road construction products as solid asphalt, liquid or cutback asphalt, emulsified asphalt, and semi-solid and liquid tars. The valuable ingredient in any of the bituminous materials is the bitumen content, and is the only part of the material that actually will cement stone or gravels together. If these particles of stone or gravel are not thoroughly cemented together, then, of course, they will not be waterproof. After studying the conditions on some of our roads that had previously been constructed, I noticed at certain seasons of the year and after close examination that the particles of stone or gravel were slightly separated, which would indicate that there was not enough bitumen to waterproof the surface thoroughly.

After thoughtful consideration it is quite evident that a bituminous material is purchased only for two reasons, namely, to *cement* and *waterproof* aggregates when used in road construction. Any water in the material is of no value. Any excess dirt and lighter oils in the material are of no lasting value. The bitumen content in the material is the only thing of lasting value in our line of work. We are compelled to get enough bitumen into the road to cement and waterproof the aggregate thoroughly. Therefore, in getting better and longer wearing surfaces, this net bitumen content is the important factor, and not the total volume of the bituminous material used.